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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/820,527

04/07/2004

Christopher M. Aubuchon

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09/03/2004

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EXAMINER

THOMAS, BRANDI N

ART UNIT

PAPER NUMBER

2873

DATE MAILED: 09/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/820,527

Applicant(s)

AUBUCHON, CHRISTOPHER M.

Examiner

Brandi N Thomas

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-59 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 10, 21-31, 44-53 and 55-59 is/are rejected.
- 7) ☒ Claim(s) 8, 9, 11-20, 32-43 and 54 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>4/7/04</u> . | 6) <input checked="" type="checkbox"/> Other: <u>Detailed Action</u> . |

DETAILED ACTION

Information Disclosure Statement

1. Acknowledgement is made of receipt of Information Disclosure Statement(s) (PTO-1449) filed 4/7/04. An initialed copy is attached to this Office Action.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-7, 10, 21, 25-27, 31, 44-49 are rejected under 35 U.S.C. 102(b) as being anticipated by Hornbeck (5583688).

Regarding claims 1, 25, 44 and 45, Hornbeck discloses a micromirror device (100) comprising: a substrate (318) with electrical components including address circuitry; a micromirror (300) (col. 4, lines 19-21) (figure 3); and a unitary support structure interconnecting said substrate and said micromirror, said support structure including a first torsion member mounted at two locations on said substrate and a second torsion member mounted to opposite ends of said micromirror, said torsion members configured to permit rotation of said micromirror about multiple axes of rotation (figure 2) (col. 3, lines 44-64).

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Regarding claims 2 and 26, Hornbeck discloses two opposite ends of said micromirror are opposite corners (figure 2). Regarding claim 26, Hornbeck further discloses the micromirror in a quadrilateral shape (figure 2).

Regarding claims 3 and 27, Hornbeck discloses two opposite ends of said micromirror are opposite sides (figure 2). Regarding claim 27, Hornbeck further discloses the micromirror in a quadrilateral shape (figure 2).

Regarding claim 4, Hornbeck discloses two locations on said substrate to which said at least one first torsion member are mounted on locations underlying two opposite ends of said micromirror (figure 2).

Regarding claim 5, Hornbeck discloses the support structure underlies micromirror (figure 2).

Regarding claims 6 and 31, Hornbeck discloses electrical components further comprise electrodes (218) adapted to apply attractive forces to said micromirror (col. 6, lines 10-12).

Regarding claim 7, Hornbeck discloses electrodes oriented beneath gap locations defined by said torsion members (col. 3, lines 58-64) (figure 2).

Regarding claim 10, Hornbeck discloses four of said electrodes (218) each having substantially the same shape (figure 2).

Regarding claims 21 and 48, Hornbeck discloses micromirror is substantially quadrilateral (figure 2). Regarding claim 48, Hornbeck further discloses first and second pairs on opposing corners, and each said second torsion component having first and second ends connected to opposite corners of one of said first and second pairs, and each said respective first

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torsion component having first and second ends mounted to said substrate at locations underlying the other of said first and second pairs (figure 2).

Regarding claims 46, Hornbeck discloses first torsion components of at least two adjacent micromirror devices are commonly mounted to said substrate (figure 2).

Regarding claim 47, Hornbeck discloses each said support structure comprises a universal joint, each of said first and second respective torsion components intersecting each other (figure 2).

Regarding claim 49, Hornbeck discloses ends of first torsion components, which are adjacent one another in adjacent micromirrors are commonly mounted to said substrate (figures 2 and 3).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 22-24 and 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hornbeck (5583688).

Regarding claim 22 and 28-30, Hornbeck discloses a micromirror but does not specifically disclose the mirror in a hexagonal shape. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a hexagonal mirror since it is well known in the art that a hexagonal mirror is used for allowing sufficient packing of the array.

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Therefore it would have been obvious to modify the shape of the mirror for the purpose of sufficient packing of the array. Regarding claims 28, 29 and 30, Hornbeck further discloses the claimed invention except for including a third pair of opposing corners and a third pair of opposing sides. It would have been obvious to one having ordinary skill in the art at the time the invention was made to include a third pair this being reasonably based upon a hexagon having six sides and opposite sides and corners of the six sides would include three pairs. Therefore it would have been obvious to include a third pair for the purpose of a hexagon having six sides and opposite sides and corners of the six sides would include three pairs.

Regarding claims 23 and 24, Hornbeck discloses the claimed invention except for the diameter of the micromirror. It would have been obvious to construct the diameter of the mirror to be less than or equal to 1 mm or less than 10 microns, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980)). It would have been obvious to one having ordinary skill in the art at the time the invention was made to construct the diameter of the mirror to be less than or equal to 1 mm or less than 10 microns for the purpose of permitting the use of multiple mirrors for reflection of the optical signal.

6. Claims 50-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laor et al. (2003/0142900 A1).

Regarding claims 50, 51, and 53, Laor et al. discloses, in figure 2, an optical switching mechanism (110), comprising: a first array (120) of optical reflectors (122) adapted to receive and reflect optical signals from at least one optical input source (112); and a second array (130)

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of optical reflectors (132) adapted to receive optical signals reflected from said first array (120) of optical reflectors (122) and reflect the optical signals toward at least one optical output (114) (section 0041); at least one of said optical reflectors comprising an assembly of micromirror devices (figures 6 and 7) (section 0044) but does not specifically disclose the micromirror devices being adapted for three dimensional orientation. However, Loar et al. does disclose that the mirrors can move about two orthogonal axes (x and z axes). It would have been obvious to one having ordinary skill in that art at the time the invention was made to modify the mirrors to tilt about a third axis (y axis) for the purpose of allowing an additional direction for the light to reflect into the optical fibers.

Regarding claim 52, Loar et al. discloses an optical switching mechanism wherein each said optical reflector (122 and 132) comprises an assembly of micromirror devices (section 0005 and 0044).

7. Claims 55-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Loar et al. (2003/0142900 A1) as applied to claim 50 above, and further in view of Hornbeck (5583688).

Regarding claim 55, Loar et al. teaches the claimed invention except that it does not show micromirror device adapted for three dimensional orientation comprises a substrate with electrical components including address circuitry; a micromirror; and a support structure underlying said micromirror and joining said substrate with said micromirror, said support structure including a first torsion component having first and second ends mounted to said substrate and a second torsion component having first and second ends mounted to opposite ends of said micromirror, said support structure being configured to permit rotation of said

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micromirror about multiple axes of rotation.. Hornbeck shows that it is known to provide a micromirror device (100) adapted for three dimensional orientation comprising: a substrate (318) with electrical components including address circuitry; a micromirror (300) (col. 4, lines 19-21) (figure 3); and a unitary support structure underlying said micromirror (300) and joining said substrate (318) with said micromirror (300), said support structure including a first torsion component having first and second ends mounted to said substrate and a second torsion component having first and second ends mounted to opposite ends of said micromirror (300), said support structure being configured to permit rotation of said micromirror about multiple axes of rotation for an redirecting incident light and produce patterns and images (figure 2) (col. 3, lines 44-64). Therefore it would have been obvious to someone of ordinary skill in the art at the time the invention was made to combine the device of Loar et al. with the micromirror device of Hornbeck for the purpose of for an redirecting incident light and produce patterns and images (figure 2) (col. 3, lines 44-64).

Regarding claim 56, Hornbeck discloses an optical switching mechanism wherein said support structure comprises a universal joint, said first and second torsion components intersecting one another (figure 2).

Regarding claim 57, Hornbeck discloses an optical switching mechanism wherein said micromirror (300) is substantially quadrilateral (figure 2) having first and second pairs of opposing corners, said first and second ends of said first torsion component are connected to opposite corners of one of said first and second pairs, and said first and second ends of said second torsion component are mounted to said substrate at locations underlying the other of said first and second pairs (figure 2) (col. 3, lines 44-64).

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Regarding claim 58, Hornbeck discloses an optical switching mechanism wherein said electrical components further comprise electrodes (218) adapted to apply attractive forces to said micromirror (col. 6, lines 10-12), said electrodes oriented beneath gap locations defined by said torsion members (col. 3, lines 58-64) (figure 2).

Regarding claim 59, Hornbeck discloses the claimed invention except for the diameter of the micromirror. It would have been obvious to construct the diameter of the mirror to be less than or equal to 1 mm or less than 10 microns, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980)). It would have been obvious to one having ordinary skill in the art at the time the invention was made to construct the diameter of the mirror to be less than or equal to 1 mm or less than 10 microns for the purpose of permitting the use of multiple mirrors for reflection of the optical signal.

Allowable Subject Matter

8. Claims 8-9, 11-20, 32-43, and 54 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. The prior art taken either singularly or in combination fails to anticipate or fairly suggest the limitations of the independent claim(s), in such a manner that a rejection under 35 U.S.C. 102 or 103 would be proper. The prior art fails to teach a combination of all the claimed features as presented in claim(s) 8-9, 11-20, 32-43, and 54, wherein the claimed invention comprises wherein at least one of said electrodes is configured with a plurality of portions at different levels

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so that portions further from a center of rotation of said micromirror are at a greater distance from the micromirror than portions closer to the center of rotations and wherein the micromirror devices form smart surfaces, as claimed.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Knipe (6552840 B2) discloses a micromechanical device having improved electrostatic efficiency.

Miller (US 2003/0002019 A1) discloses a method of lubricating a MEMS device using fluorosurfactants.

Carter et al. (6028690) discloses a micromirror array fabricated on a semiconductor substrate.

Meier et al. (6522454 B2) discloses a DMD type spatial light modulator having an array of pixels.

Strumpell et al. (6614576) discloses a method for enhancing the optical performance of a reflective spatial light modulator by micro-planarizing surfaces within the SLM.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brandi N Thomas whose telephone number is 571-272-2341.

The examiner can normally be reached on 8-5.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on 571-272-2328. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

BNT

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August 5, 2004



RICKY MACK
PRIMARY EXAMINER